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(54) **AVALANCHE PIXEL SENSORS AND
RELATED METHODS**

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patent is extended or adjusted under 35
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H01J 40/14 (2006.01)

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250/214 R

(58) **Field of Classification Search** 250/370.01,
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See application file for complete search history.

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(57) **ABSTRACT**

According to an embodiment, an avalanche pixel sensor
includes a substrate having opposite first and second surfaces,
first sensor elements operating in breakdown mode situated
on the first surface of the substrate for detecting ionizing
radiation from a radiation-emission source, second sensor
elements operating in breakdown mode situated on the sec-
ond surface of the substrate, the second sensor elements each
paired with a corresponding first sensor element to experi-
ence substantially coincident breakdown in response to ion-
izing radiation. Logic elements are each electrically intercon-
nected to a respective pair of first and second sensor elements
for receiving a signal or signal representing the substantially
coincident breakdown of the respective pair to be distin-
guished from a dark signal even in either of the pair of the first
and second sensor elements. Additionally, a detector array,
a sensing apparatus, and a method of detecting ionization radia-
tion using first and second sensor elements disposed on oppo-
site sides of a substrate are also provided.

25 Claims, 7 Drawing Sheets

